Tone systems of Dinka dialects

Bert Remijsen (University of Edinburgh)
Goals of my research on Dinka tone

• Investigate the parameters of divergence between dialects of Dinka, in terms of:
  - inventory
  - realisation
  - contextual processes

• Consider the relevance of the findings to theory and typology.
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  - realisation
  - contextual processes

• Consider the relevance of the findings to theory and typology.

Part 1

Part 2
Dinka is:
a Nilo-Saharan language
spoken in Southern Sudan
by approx. 2 million people.

Figure: The Dinka language area, marked on the Nile tributary network.
My investigations on tone in Dinka so far:

- 8 dialects studied;
- 3+ speakers per dialect;
- tonemes in various word patterns and sentence contexts;
- phonological and phonetic analyses.
Part 1 / Vowels, voice quality, length

- Seven vowel phonemes: /i, e, ɛ, a, ɔ, o, u/

- Two phonemic voice qualities (modal vs. breathy):
  - ròoor ‘forest.SG’
  - ròoor ‘man.PL’

- Three levels of vowel length (V / VV / VVV):
  - cól ‘mouse.SG’
  - cǒol ‘charcoal.SG’
  - còool ‘charcoal.PL’
Most dialects have 4 distinctive tone patterns or tonemes: High (H), Falling (HL), Low (L), Rising (LH).
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E.g. Luanyjang (Luac) – Remijsen & Ladd (2008):

<table>
<thead>
<tr>
<th>H</th>
<th>HL</th>
<th>L</th>
<th>LH</th>
</tr>
</thead>
<tbody>
<tr>
<td>bàn</td>
<td>gêem</td>
<td>jùr</td>
<td>cǒok</td>
</tr>
<tr>
<td>chief.SG</td>
<td>cheek.SG</td>
<td>stranger.SG</td>
<td>foot.SG</td>
</tr>
<tr>
<td>léen</td>
<td>tîiim</td>
<td>nòoon</td>
<td>pǎal</td>
</tr>
<tr>
<td>drum.SG</td>
<td>tree.PL</td>
<td>grass.SG</td>
<td>knife.SG</td>
</tr>
</tbody>
</table>
Main difference in realisation among the 4-toneme dialects: relative height of the LH:

Figure: Averaged f0 traces of the tonemes in Nyarweng and Luanyjang, on the voiced part of the rhyme. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.
Part 1 / Word structure

- The great majority of Dinka words consists of closed monosyllables, e.g.:
  - bîn
    cup.SG
  - mjèɛɛr
    giraffe.PL

- Native polysyllabic words invariably begin with /a-/ and end in a closed syllable, e.g.:
  - apáaɑr
    buffalo.SG
  - adọok
    gourd.PL

- Only the final syllable carries tone phonologically.
Part 1 / Tonal crowding

Tonal crowding

- Contour tones $\rightarrow$ >1 tone target per TBU;
- TBU = $\sigma$
- 1-syllable words
- V vs. VV vs. VVV

Limited amount of segmental material for tonal realisation (cf. Xu 2004)
Part 1 / Tonal crowding

Phonological ‘solution’ to tonal crowding:

• In some dialects, tone sandhi reduces the number of tone targets in particular contexts.
Bor Dinka:

- HL -> H becomes in all non-final contexts.

- Rule – HL simplification:

  \[ \sigma \# \sigma \]

  \[ \text{H} \wedge \]

  Figure: An illustration of HL Simplification in the Bor dialect of Dinka.
Phonetic ‘solution’ to tonal crowding:
• Nyarweng Dinka: no phonological mechanisms; just articulatory undershoot when segmental material is limited.
Figure: Illustration of HL Simplification in Bor vs. its absence in Nyarweng.
Figure: The effect of vowel length on the phonetic realisation of the HL contour tone in Nyarweng.
Another dialect, Luanyjang, gets rid of HL contours by means of a different phonological process: Dissimilatory Lowering.

This process sheds light on the nature of the contour tones.
### Part 1 / Tone sandhi

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<tr>
<th>H L H &gt; H L H</th>
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<tr>
<th>Tone Pattern</th>
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<td>Achol D-PAST tree.PL hate.INF ‘Achol hated trees.’</td>
</tr>
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### Part 2 / Tone sandhi

- **Summary of Dissimilatory Lowering in Luanyjang:**

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• Rule:
Part 1 / Conclusions

- Four tonemes: High, Low, Rise (LH), Fall (HL);
- No interaction with three-level vowel length at the level of the inventory: the TBU is the syllable;
- Most but not all dialects have sandhi rules that reduce tonal crowding.
Part 2: Tone in Dinka dialects from the perspective of Dispersion Theory
Part 2 / Introduction

• Dispersion Theory (Liljencrants & Lindblom 1972, Becker-Kristal 2010):
  - vowel categories are good to the extent that they are perceptually distinct from one another;
  - vowel categories are adaptive: they maximise perceptual distance.
Part 2 / Dispersion Theory in vowel systems

• Dispersion Theory is well-supported for vowel systems. Illustration from Becker-Kristal (2010):

  Five-vowel systems

  Figure: descriptive stats on F1xF2 values in 5-vowel systems (41 languages).
• Dispersion Theory is well-supported for vowel systems. Illustration from Becker-Kristal (2010):

Five-vowel systems

Seven-vowel systems

Figure: descriptive stats on F1xF2 values in 5-vowel systems (41 languages) vs. 7-vowel systems (32 languages).
Part 2 / Dispersion Theory in tone systems

• The detailed phonetic realisation of vowel categories has implications for their phonological representation.

• My argument: Dispersion Theory can also benefit the study of tone – it can inform the evaluation of competing analyses.
Part 2 / Dispersion Theory in tone systems

- Consider the realisation of the Fall toneme (full line) in three dialects of Ma’ya (Remijsen 2001):

![Figure: Averaged F0 traces (8 spks/dialect) of the 3 tonemes of Ma’ya in utterance-final context, in 3 dialects.](image)

Figure: Averaged F0 traces (8 spks/dialect) of the 3 tonemes of Ma’ya in utterance-final context, in 3 dialects.
Part 2 / Three- vs. four toneme systems

- Three dialects of Dinka have only 3 tonemes:
  - Western Twic
  - Ruweng
  - Agar (Andersen 1987)
• H (purple) vs. LH (red) is neutralised in Twic (3T): its H toneme is at the top end of the tonal space.

Figure: Averaged f0 traces of the tonemes of the Nyarweng, Luanyjang and Twic. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.
Part 2 / Twic

- Sound example – pǎal ‘knife.SG’ by 2 speakers of each of these three dialects:
Part 2 / Agar and Ruweng

• In Ruweng (3T) and Agar (3T), however, the ‘High’ is not at the top. Contrary to Dispersion Theory.

Figure: Averaged f0 traces of the tonemes of Ruweng, Agar and Twic. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.
• Sound example – Ꙣaal ‘knife.SG’ by 2 speakers of each of these three dialects:
In Ruweng (3T) and Agar (3T), *H and *HL have neutralised: both are falling in final position and high elsewhere.

Example – a *H infinitive verb:

<table>
<thead>
<tr>
<th>Nyarweng (4T)</th>
<th>Deng  D-PAST grass.SG   hate.INF  ‘Deng hated grass.’</th>
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<td>Dèeŋ à-cí nòoon máaan</td>
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Part 2 / Agar and Ruweng

- In Ruweng (3T) and Agar (3T), *H and *HL have neutralised.

<table>
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<tr>
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<th>*L</th>
<th>*LH</th>
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<tr>
<td>4-toneme dialects</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Agar, Ruweng</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
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• What is the most appropriate phonological representation of the toneme?

\[ /H\sim HL/ \]

- H #
- HL %
• What is the most appropriate phonological representation of the toneme?

• Andersen (1987) on Agar:

\[
/\text{HL}/ \quad \begin{array}{c}
\text{H} \# \\
\text{HL} \% \\
\end{array}
\]
Part 2 / Agar and Ruweng

• What is the most appropriate phonological representation of the toneme?

• Andersen (1987) on Agar:

Contrary to Dispersion Theory: the ‘H’ (red line) does not shift upwards to maximise perceptual distance.
• What is the most appropriate underlying representation?

• Reanalysis proposed here:

```
/H/
```

```
H# /H/ HL %
```

Part 2 / Agar and Ruweng

![Diagram](image)
Part 2 / Agar and Ruweng

- What is the most appropriate underlying representation?
- Reanalysis proposed here:

```
/H/
  \[ \text{H} \] \[
  \text{HL} \%
```

In line with Dispersion Theory: the H (blue line) is at the top of the tonal space
• There is additional support for the reanalysis from Dissimilatory Lowering in the Ruweng dialect – remember Luanyjang:
## Dissimilatory Lowering in Luanyjang (4T):

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Part 2 / Agar and Ruweng

- Summary of Dissimilatory Lowering in Luanyjang Dinka (4T):

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<td>H L H</td>
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<tr>
<td>H H H</td>
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</tr>
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<td>H LH H</td>
<td>H LH L</td>
</tr>
<tr>
<td>H HL H</td>
<td>H L H</td>
</tr>
</tbody>
</table>

- Rule:
Part 2 / Agar and Ruweng

- Dissimilatory Lowering in Ruweng Dinka (3T) – transcription following Andersen (1987) on Agar:

<table>
<thead>
<tr>
<th>Dissimilatory Form</th>
<th>Agar Translation</th>
</tr>
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<tr>
<td>H L HL &gt; H L HL</td>
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Part 2 / Agar and Ruweng

• Summary of Dissimilatory Lowering in the Ruweng dialect (3T):

<table>
<thead>
<tr>
<th>Application of Andersen (1987) to Ruweng</th>
<th>This reanalysis:</th>
</tr>
</thead>
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<td>Observed</td>
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<tr>
<td>H HL HL</td>
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<td>H H HL</td>
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</tr>
</tbody>
</table>
The reanalysis proposed here allows for a better generalisation of Dissimilatory Lowering in Ruweng.

Rule – same as in Luanyjang (4T):

\[
\begin{array}{c}
\sigma \\
\sigma \\
H \\
H \\
L
\end{array}
\]
• Three lines of evidence support the same analysis, i.e., that H underlies H~HL in Ruweng:
  - Dispersion Theory
  - cognates from 4T dialects
  - Dissimilatory Lowering

• They suggest that the surface realisation found in citation and sentence-finally (HL) is not the phonological representation.
• In Agar, the other 3T dialect, however, there is no Dissimilatory Lowering, and Andersen (1987) is solely based on data from this dialect.

• Here the positioning of the tonemes in the tonal space provides the only dialect-internal argument for the interpretation that the underlying representation of /HL~H/ is H, rather than HL.
Part 2 / Conclusion

• The phonetic realisation of tonal categories reflects their phonological nature, just as is the case for vowels;

• The predictions of Dispersion Theory re. the phonetic realisation of sound categories can contribute to the phonological analysis of tone systems.


Acknowledgements

• John Penn de Ngong, Peter Malek Ayuel, Caguor Adong Manyang, Simon Kuengbuny Pal, Akol Kongoor Reech, Simon Yak Deng for assistance in making the recordings.

• The speakers who took part in the elicitation sessions.

• Torben Andersen, Larry Hyman, Bob Ladd, Peter Ladefoged, Tatiana Reid, and Alice Turk, for thought-provoking discussions on Dinka tone over the years.

• SIL Sudan (director: Elizabeth Newport) and the Institute of African & Asian Studies at University of Khartoum (director: Al-Amin Abu-Manga), both for sponsorship of and support during data collection in Sudan.

• The Arts & Humanities Research Council and The British Academy, for research funding under several grants.
Part 1 / The grammatical function of tone

• Like the other suprasegmental distinctions, tone is heavily involved in the morphosyntax – e.g.:

```
adwɔɔk  ʔ-ṃɛl
    gourd.SG   AGR-soil.2SG
You make the gourd dirty.
```

```
adwɔɔk  ʔ-ṃɛl
    gourd.SG   AGR-soil.PASS
The gourd is being made dirty.
```